Appendix H

Efforts by the European Community

H.1 CAVASSOO

The European Community project CAVASSOO (Carbon Variability Studies by Ships of Opportunity) was approved for funding in fall 2000 and started formally in 2001. CAVASSOO is aimed at providing an improved estimate of the uptake of CO_2 by the North Atlantic, and how this varies from season to season and year to year. Results will, in turn, assist in constraining estimates of European and North American terrestrial (vegetation) sinks, using atmospheric inverse modeling techniques. To obtain whole-basin estimates, we will set up four routes (see Fig. H-1) on which automated surface pCO_2 and related measurements will be made using ships of opportunity. To interpolate between these transects, which are few in number but frequent in time, we will use the existing data on CO_2 measurements to inform the interpolation. The new data and historical data will be made rapidly available. Combined with ocean carbon models and atmospheric transport models, our data will result in improved estimates of the net CO_2 flux over the North Atlantic, Europe, and North America. The overall objective can be broken into subsidiary objectives:

1. Establish a basic North Atlantic surface pCO_2 observing system.
2. Produce and make available a North Atlantic pCO_2 database.
3. Assess errors and uncertainties in existing pCO_2 climatologies.
4. Estimate seasonal air-sea CO_2 fluxes for the North Atlantic.
5. Evaluate ocean carbon models with regard to air-sea flux variability.
6. Improve atmospheric inversion estimates of carbon sources and sinks.

The consortium includes the following groups:

- School of Environmental Sciences, University of East Anglia, Norwich, UK (A.J. Watson, N. Lefèvre).
- Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France (P. Ciais, J. Orr).
- Instituto de Investigaciones Mariñas, Vigo, Spain (A. Ríos, F.F. Pérez).
- Institute of Marine Research at the University of Kiel, Germany (D.W.R. Wallace, A. Körtzinger).
- Geophysical Institute, University of Bergen, Norway (T. Johannessen).

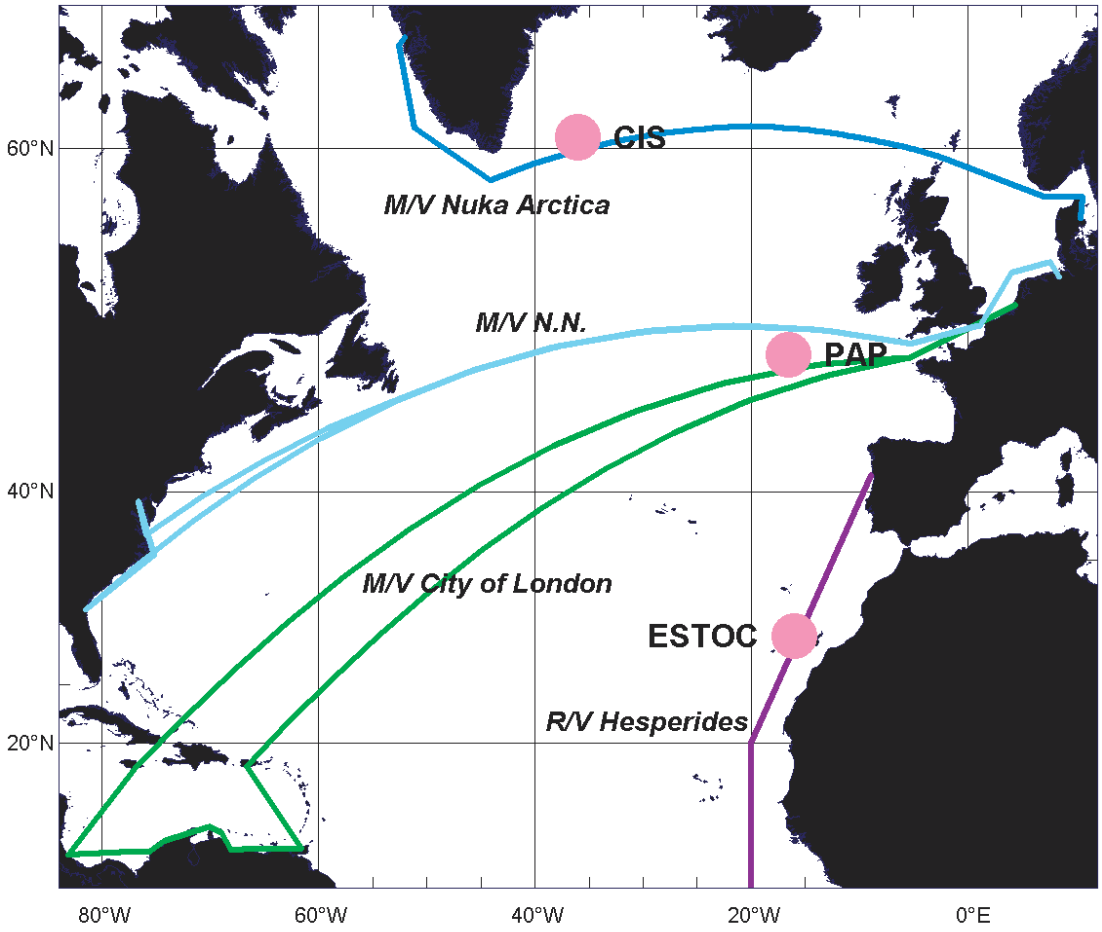

Figure H-1: Proposed ship tracks for automated pCO_2 and related measurements on ships of opportunity in the North Atlantic.

H.2 ANIMATE

The European Community project ANIMATE (Atlantic Network of Interdisciplinary Moorings and Timeseries for Europe) was approved for funding in January 2001 and the 3-year program started 1 December 2001, to continue through November 30, 2004. It will implement a moored observing infrastructure to provide regular observations of ocean carbon cycle variability and processes, from three selected sites in the northeast Atlantic. Each mooring will carry a near-surface CO_2 sensor, upper-layer temperature/salinity sensors, an upward-looking Acoustic Doppler Current Profiler (ADCP), a nutrient and fluorescence sensor, and a deeper sediment trap. Part of the data will be telemetered in real time. The specific sites were chosen to build on existing European time-series measurements and observational efforts/interests. They are representative of distinct biogeochemical regions of the northeast Atlantic, lie close to VOS lines to be implemented as part of CAVASSOO for routine surface pCO_2 measurements, and network with

non-European elements of the North Atlantic observing system. The chosen locations (see Fig. H-1) are ESTOC (European Station for Time-Series in the Ocean Canary Island) near the Canary Islands, PAP (Porcupine Abyssal Plain) west of Ireland, and CIS (Central Irminger Sea). The overall objective can be broken into subsidiary goals:

1. Assure a sustained European carbon cycle time-series infrastructure at three key sites in the northeast Atlantic that are networked within a larger-scale ocean carbon observing system.

2. Unify the present mix of uncoordinated European ship-based and moored repeat measurements in the three target areas and upgrade/replace them with identical, CO_2-relevant moored systems in all sites.

3. Make maximum use of existing infrastructure, instrumentation, hardware, and expertise from different groups; and share/transfer the existing and new elements of the system for joint implementation and operation.

4. Implement real-time telemetry of subsets of the prime data to be collected.

5. Make both the produced data and the mooring infrastructure available to the wider community.

6. Interface intimately with other programs having the same data or infrastructure requirements.

The consortium includes the following groups:

- Institute of Marine Research at the University of Kiel, Germany (U. Send [coordinator], S. Harms, D.W.R. Wallace).

- Southampton Oceanographic Centre, UK (R.S. Lampitt, D.J. Hydes, B. Dupée).

- Department of Geosciences, University of Bremen, Germany (G. Wefer, H.C. Waldmann, V. Ratmeyer).

- Instituto Canario de Ciencias Marinas, Gran Canaria, Spain (E. Pérez-Martell, O. Llinás).

- Marine Research Institute, Reykjavik, Iceland (H. Valdimarsson, O.S. Astthorsson, A. Gislason, J. Ólafsson).